

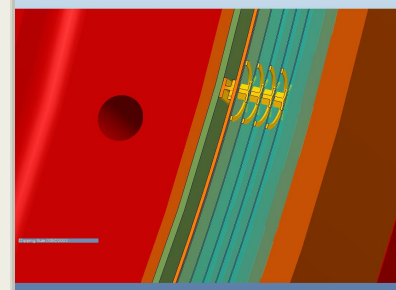
Vapor Cooled Structure MLI: Efficient Vapor Cooling of Structural Elements, Phase I

Completed Technology Project (2015 - 2015)



Project Introduction

Human exploration requires new technologies for advanced in-space propulsion systems. Improvements in cryogenic propellant storage are a critical need. NASA's Technology Roadmaps call "Zero Boil Off storage of cryogenic propellants for long duration missions" the #2 technical challenge for future NASA missions. Heat leak through tank mounts such as struts and skirts is an increasingly large part of the total heat flow into modern, well insulated tanks. Quest Thermal has developed several innovative, advanced thermal insulation systems, offering high performance for specific applications such as on-orbit (IMLI), in-air (LRMLI) or launch ascent (Launch Vehicle MLI). Quest Thermal proposes to design and develop an innovative system capable of vapor cooling structural members such as skirts and struts. Vapor Cooled Structure – MLI (VCSMLI) should provide unique properties, utilizing boiloff propellant to effectively cool otherwise non insulated structures. Quest Thermal Discrete Spacer Technology offers the unique ability to provide controlled layer spacing to act as a simple, efficient flow chamber for utilization of boiloff vapor cooling. Vapor Cooled Structure MLI is a novel system that uses discrete spacers to create and support a sealed vapor transport inner layer within a high performance IMLI system reducing heat leak by nearly 50%. This Phase I program will develop a new insulation system that will be modeled and analyzed to predict heat flux reduction. A specialized vapor cooled structure with a custom spacer will be designed. VCSMLI will be fabricated, installed on a skirt-mounted tank, and performance measured with and without vapor cooling.

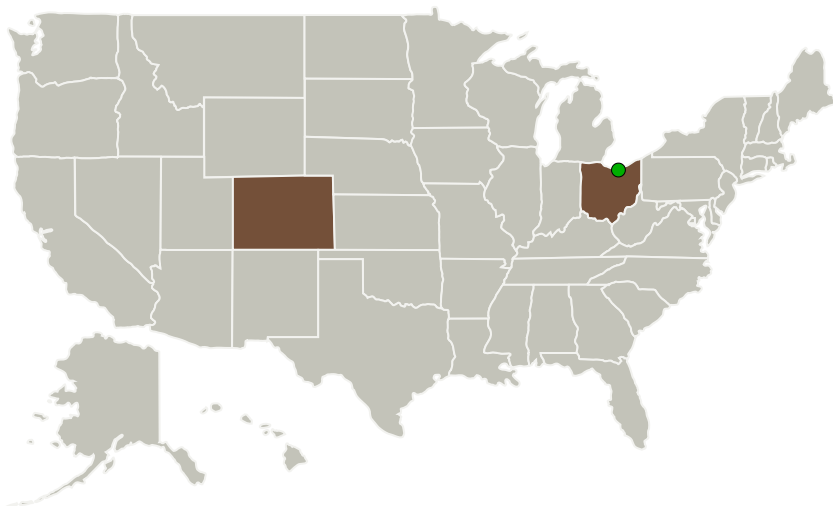


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Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Quest Thermal Group	Lead Organization	Industry	Arvada, Colorado
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Colorado	Ohio

Project Transitions

June 2015: Project Start

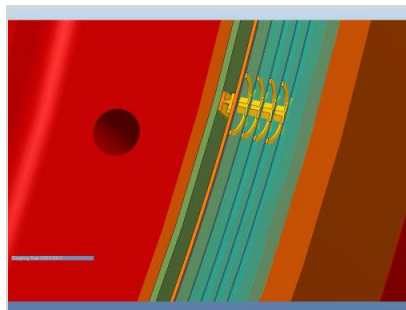
December 2015: Closed out

Closeout Summary: Vapor Cooled Structure MLI: Efficient Vapor Cooling of Structural Elements, Phase I Project Image Vapor Cooled Structure MLI: Efficient Vapor Cooling of Structural Elements, Phase I

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/139415>)

Images



Briefing Chart Image

Vapor Cooled Structure MLI:
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Elements, Phase I
(<https://techport.nasa.gov/image/127293>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Quest Thermal Group

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Scott A Dye

Co-Investigator:

Scott Dye

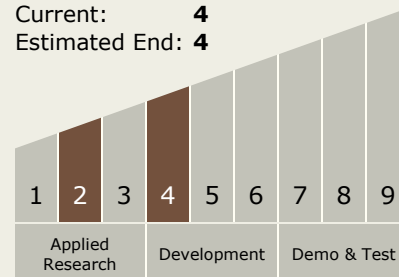
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Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.1 Cryogenic Systems
 - └ TX14.1.1 In-space Propellant Storage & Utilization

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System